Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **14CE3018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DESIGN OF SUBSTRUCTURES** | **Max. marks :** | **100** |

**(ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

**(Use of IS;2911(Part 1/Sec. 1), IS:6403 and IS;456 Permitted)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain how is the depth of subsoil exploration decided. | CO1 | 5 |
| b. | List the objectives of site investigation. | CO1 | 3 |
| c. | Discuss the reasons for failure of foundation. | CO1 | 5 |
| d. | Bring out the steps carried out by a foundation engineer to arrive at the suitable foundation for a given structure in a given site. | CO1 | 7 |
| (OR) | | | | |
| 2. | a. | Enumerate the steps involved in subsoil exploration. | CO1 | 5 |
| b. | Explain any one laboratory test for soil investigation. | CO1 | 5 |
| c. | Explain with neat sketch how the Plate Load Test is carried out in the field. | CO1 | 5 |
| d. | Discuss the requirements of a good foundation to ensure structural integrity and economy. | CO1 | 5 |
| 3. | a. | What precautions are to be taken while locating a footing i. on a slope and ii.adjacent to an existing structures. | CO2 | 5 |
|  | b. | Explain the General shear failure, Local shear failure and punching shear failure mode. | CO2 | 5 |
|  | c. | A rectangular footing having a size of 1.8mx3m has to transmit the load of a column at a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use IS code method. The soil has following properties: Porosity, n=40%; Specific Gravity, G=2.67; water content, w=15%; Cohesion, c =8kN/m2 ; Angle of shearing resistance ϕ =32°; | CO2 | 10 |
| (OR) | | | | |
| 4. | a. | What are the various types of combined footings and explain the situations for their choice? | CO2 | 5 |
|  | b. | Explain Terzaghi’s bearing capacity theory. | CO2 | 5 |
|  | c. | Explain the basic principle of floating foundation. | CO2 | 5 |
|  | d. | Discuss any one field test for determining bearing capacity. | CO2 | 5 |
| 5. | a. | Explain Pile load test. | CO2 | 5 |
|  | b. | What do you understand by ‘negative skin friction’ ? | CO2 | 3 |
|  | c. | Determine the group capacity from the following data. Data:  Pile dia. = 300 mm, Pile length= 12 m, No. of piles = 16 (4 rows with 4 piles in each row), Spacing= 900 mm (in both directions), qu = 126 kN/m2 , α = 0.75, F = 3, Nc = 5.14. | CO2 | 5 |
|  | d. | A column carrying a load of 3000KN has to be supported by four piles each of 350mmx350mm. The piles are spaced at 1m centers. The column size is 650mmx650mm. Design the pile cap. Given the grade of concrete is M20 and steel Fe=415. Use limit state method. | CO2 | 7 |
| (OR) | | | | |
| 6. | a. | List out the various factors that are to be considered for the selection of pile foundation. | CO2 | 5 |
|  | b. | Define the 'group efficiency factor' of a pile group and list the factors influencing the efficiency of a pile group. | CO2 | 5 |
|  | c. | A 12m long 300mm square pre-cast concrete pile is driven into a sand stratum by a single acting steam hammer. The weight of the hammer ram is 14kN and the stroke is 750mm. The pile showed a driving resistance of 5 blows/25mm penetration. Estimate the ultimate bearing capacity of the pile based on the Hileys formula. Take C = 0.00508m. | CO2 | 5 |
|  | d. | Design the bored cast in-situ RCC Pile of structural capacity 750 kN using M25 Concre and Fe 415 steel. | CO2 | 5 |
| 7. | a. | Draw a neat sketch and explain the various components of well foundation. | CO2 | 6 |
|  | b. | The results of a ‘block vibration test’ using a R.C. block of size 1.2 x 1.2 m (in plan) x 1 m (height) are given below. Draw the ‘response curve’ and determine the values of Cu, k and D (%) of the soil. Take the unit weight of reinforced concrete as 25 kN/m3. | CO2 | 6 |
|  | c. | A machine weighing 400 kN is mounted on a concrete foundation block resting on a soil layer. The plan area of the foundation block is 25 m2. Its weight is 1000 kN. Assume that the system is subjected to unbalanced force in vertical direction. The coefficient of the uniform compression for the soil is 105 kN/m3. Calculate the natural frequency of the machine foundation if: i. weight is kept constant and foundation area is doubled. ii.Area is kept constant and weight is doubled. | CO2 | 8 |
| (OR) | | | | |
| 8. | a. | What are the various types of machine foundations used for different kinds of machinery? Give neat sketches. | CO2 | 5 |
|  | b. | Bring out the design criteria for the design of foundation for reciprocating machines. | CO2 | 5 |
|  | c. | The foundation for an impact machine has the following data  Weight of Tup = 15 kN  Height of fall = 1100mm  Weight of anvil = 300 kN  Efficiency of fall of ram = 92%  Coefficient of restitution = 0.50  Steam pressure = 600 kPa  Area of piston = 0.15m2  Limiting frequency of anvil = 240 radiance/ second.  Natural Frequency of the combined system = 275 rad/sec.  Determine the velocity of Tup before impact and that of the anvil after impact. Also determine the amplitude of vibration of the anvil and the foundation. | CO2 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss the special techniques that are employed for the design of foundation in expansive soils. | CO2 | 5 |
|  | b. | Discuss the application of reinforced earth construction. | CO2 | 5 |
|  | c. | Bring out the types of ground anchors and their applications with sketches. | CO2 | 5 |
|  | d | Enumerate the design steps for the foundation of a RC Chimney. | CO2 | 5 |

ALL THE BEST